

PATENT COOPERATION TREATY

PCT


INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 15 JUN 2005

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Applicant's or agent's file reference 101.0122PCT		FOR FURTHER ACTION See Form PCT/PEA/416	
International application No. PCT/GB2004/001355		International filing date (day/month/year) 31.03.2004	Priority date (day/month/year) 24.04.2003
International Patent Classification (IPC) or national classification and IPC G01K11/32			
Applicant SENSOR HIGHWAY LIMITED			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau) a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand 25.09.2004		Date of completion of this report 15.06.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer Telephone No. +31 70 340- de Bakker, M	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/001355

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4)
- ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

38 as originally filed

Claims, Numbers

1-35 as originally filed

Drawings, Sheets

1/7-7/7 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 34, 35

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 34, 35 are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos.

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See separate sheet for further details

**INTERNATIONAL PRELIMINARY REPORT
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International application No.
PCT/GB2004/001355

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-33
	No: Claims	
Inventive step (IS)	Yes: Claims	1-33
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-33
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item III

Non establishment of opinion

- 1 No opinion has been established on the subject matter of independent **claims 34, 35**, for the following reasons:
 - 1.1 **Claims 34, 35** both rely on references to the description and the drawings which is only allowed in exceptional situations (Rule 6.2(a) PCT). However, in this application this is not appropriate.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1: EP-A-0 636 868 (YORK LTD) 1 February 1995
D2: US 2003/021528 A1 (CHIN ROBERT ET AL) 30 January 2003
D3: FUMIO WADA ET AL: "LONG DISTANCE DISTRIBUTED TEMPERATURE SENSOR" PROCEEDINGS OF THE CONFERENCE ON LASERS AND ELECTRO OPTICS (CLEO). ANAHEIM, MAY 21 - 25, 1990, NEW YORK, IEEE, US, vol. CONF. 10, 21 May 1990, pages 460-461, XP000282289 ISBN: 1-55752-131-X

Clarity

- 2 The application does not meet the requirements of Article 6 PCT, because independent **claims 1, 16** are not clear.
 - 2.1 It is clear from the description (p.18, line 25 and p.23, lines 21-22) that the following feature is essential to the definition of the invention:
 - (1) generating the synthetic output signal by normalising the square of the second output signal to the fourth output signal

Since independent **claim 1** does not contain this feature, it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential

to the definition of the invention.

- 2.2 The same reasoning holds for the corresponding apparatus **claim 16**.
- 2.3 The specification of the synthetic output signal is the subject of dependent **claims 3, 20**. From here on is assumed that the subject matter of **claims 3, 20** is incorporated into **claims 1, 16**, respectively.

Novelty and Inventive Step

- 3 The present application meets the criteria of Article 33(1) PCT, because the subject-matter of **claims 1-33** is considered as new (Article 33(2) PCT) and inventive (Article 33(3) PCT). The reasons being as follows:
- 3.1 The document **D1** is regarded as being the closest prior art to the subject-matter of independent **claim 1** and discloses (the references in parentheses applying to this document):

A method of using an optical fibre to obtain a distributed measurement of a parameter of interest (Col.9, lines 43-47), comprising:
deploying an optical fibre in a measurement region of interest (Col.9, line 47);
launching a first optical signal at a first wavelength λ_0 and a first optical power level into the optical fibre (Col.9, lines 47-49);
detecting backscattered light emitted from the optical fibre at a second wavelength λ_1 arising from *inelastic* scattering of the first optical signal (Col.9, lines 49-54),
and generating a first output signal therefrom, the first output signal being indicative of the parameter of interest (Col.10, lines 4-7);
detecting backscattered light emitted from the optical fibre at the first wavelength λ_0 arising from *elastic* scattering of the first optical signal, and generating a second output signal therefrom (Col.9, lines 49-51);
launching a second optical signal at the second wavelength λ_1 into the optical fibre (Col.9, line 56- Col.10, line 1);
detecting backscattered light emitted from the optical fibre at the second wavelength λ_1 arising from *elastic* scattering of the second optical signal, and generating a third output signal therefrom (Col.10, lines 1-3);

- 3.2 The subject-matter of **claim 1** therefore differs from this known distributed optical

fibre measurement in that: a third optical signal at the first wavelength λ_0 and a second optical power level less than the first optical power level is launched into the fibre.

- 3.3 The subject-matter of **claim 1** is therefore new (Article 33(2) PCT).
- 3.4 The problem to be solved by the present invention may therefore be regarded as that in D1, it is not possible to compensate for non-linear loss caused by stimulated Raman scattering (D1 only discloses how stimulated Raman scattering can be inhibited).
- 3.5 The solution to this problem proposed in independent **claim 1** of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The non-linear loss problem caused by stimulated Raman scatter (in the Stokes wavelength band) is well-known from the prior art (see, e.g., document D1: Col.3, lines 6-11).

Nevertheless, the prior art only teaches preventing or decreasing stimulated Raman scattering. Examples can be found in document D1 (Col.4, line 49- Col.5, line 8; Col.6, lines 22-34), where special measures are taken to prevent stimulated Raman scattering from occurring. Other examples can be found in document D2 (paragraph [0031]) and document D3 (the entire document), where in both cases the optical power is kept below the Raman threshold.

Therefore, an approach where the non-linear loss is *compensated* for in the corresponding equations, using a third optical (reference) signal is not obvious.

- 3.6 The same reasoning holds for the corresponding apparatus **claim 16**.
- 3.7 **Claims 2-15** and **claims 17-33** are dependent on **claims 1 and 16**, respectively, and as such also meet the requirements of the PCT with respect to novelty and inventive step.